


1241207 - R8 SDMS



Third West Air Monitor Result

Shepherd, Michael

to:

Joyce Ackerman, 'Craig Bamitz (cbamitz@utah.gov)'

04/02/2012 11:35 AM

Hide Details

From: "Shepherd, Michael" <Michael.Shepherd@PacifiCorp.com>

To: Joyce Ackerman/R8/USEPA/US@EPA, "'Craig Bamitz (cbamitz@utah.gov)'"
<cbarnitz@utah.gov>

1 Attachment



232807-1.pdf

Joyce & Craig,

We had a positive hit on Thursday, March 29, 2012. It was chrysotile, see the attached. Please let me know if you have any questions or concerns.

Thanks,

Mike Shepherd
Project Manager
Rocky Mountain Power - Major Projects
801.220.4584 Office
801.631.1310 Cell
801.220.2797 Fax
michael.shepherd@pacificorp.com



April 2, 2012

Laboratory Code: RES
Subcontract Number: NA
Laboratory Report: RES 232807-1
Project # / P.O. #: 3rd West Sub - RMP
Project Description: None Given

David Roskelley
R & R Environmental
47 West 9000 South #2
Sandy UT 84070

Dear Customer,

Reservoirs Environmental, Inc. is an analytical laboratory accredited for the analysis of Industrial Hygiene and Environmental matrices by the National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 101896-0 for Transmission Electron Microscopy (TEM) and Polarized Light Microscopy (PLM) analysis and the American Industrial Hygiene Association (AIHA), Lab ID 101533 - Accreditation Certificate #480 for Phase Contrast Microscopy (PCM) analysis. This laboratory is currently proficient in both Proficiency Testing and PAT programs respectively.

Reservoirs Environmental, Inc. has analyzed the following samples for asbestos content as per your request. The analysis has been completed in general accordance with the appropriate methodology as stated in the attached analysis table. The results have been submitted to your office.

RES 232807-1 is the job number assigned to this study. This report is considered highly confidential and the sole property of the customer. Reservoirs Environmental, Inc. will not discuss any part of this study with personnel other than those of the client. The results described in this report only apply to the samples analyzed. This report must not be used to claim endorsement of products or analytical results by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without written approval from Reservoirs Environmental, Inc. Samples will be disposed of after sixty days unless longer storage is requested. If you have any questions about this report, please feel free to call 303-964-1986.

Sincerely,

A handwritten signature in black ink, appearing to read "Jeanne Spencer Orr", written over a horizontal line.

Jeanne Spencer Orr
President

RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Lab Code 101896-0; TDH: #30-0018

TABLE I. TEM AIR FILTER SAMPLE DATA AND ANALYTICAL RESULTS

RES Job Number: RES 232807-1
 Client: R & R Environmental
 Client Project Number / P.O.: 3rd West Sub - RMP
 Client Project Description: None Given
 Date Samples Received: March 30, 2012
 Analysis Type: TEM, AHERA
 Turnaround: 24 Hour
 Date Samples Analyzed: March 31, 2012

| Client ID Number | Lab ID Number | Area Analyzed (mm ²) | Air Volume Sampled (L) | Number of Asbestos Structures Detected | Analytical Sensitivity (s/cc) | Asbestos Concentration (s/cc) | Filter Loading (s/mm ²) |
|---------------------|------------------|--|---------------------------------|---|-------------------------------------|-------------------------------------|---|
| 3W-032912 W | EM 874872 | 0.0900 | 898 | 1 | 0.0048 | 0.0048 | 11.1 |
| 3W-032912 N | EM 874873 | 0.0900 | 896 | ND | 0.0048 | BAS | BAS |
| 3W-032912 E | EM 874874 | 0.0900 | 893 | ND | 0.0048 | BAS | BAS |
| 3W-032912 S | EM 874875 | 0.0900 | 893 | ND | 0.0048 | BAS | BAS |

NA = Not Analyzed
 ND = None Detected
 BAS = Below Analytical Sensitivity
 Average Grid Opening in mm² = 0.010

Filter Material = Mixed Cellulose Ester
 Filter Diameter = 25 mm
 Effective Filter Area = 385 sq mm

ll
 Digitally signed by
 Laura L. Brown
 DN: CN = Laura
 L. Brown, C = U.S.,
 O = Reservoirs
 Environmental,
 Inc.,
 Date: 2012.04.02
 10:25:21 -0500

DATA QA

RESERVOIRS ENVIRONMENTAL, INC.

NVLAP Lab Code 101896-0; TDH: #30-0015

TABLE II. SUMMARY OF ANALYTICAL DATA

RES Job Number: RES 232807-1
 Client: R & R Environmental
 Client Project Number / P.O.: 3rd West Sub - RMP
 Client Project Description: None Given
 Date Samples Received: March 30, 2012
 Analysis Type: TEM, AHERA
 Turnaround: 24 Hour
 Date Samples Analyzed: March 31, 2012

| Client ID Number | Lab ID Number | Asbestos Mineral | Asbestos Structure Types* | | | | Structures >5 Microns in Length | **Excluded Structures | Asbestos Structures for Concentration |
|---------------------|------------------|---------------------|---------------------------|---------|----------|----------|---------------------------------------|--------------------------|--|
| | | | Fibers | Bundles | Clusters | Matrices | | | |
| 3W-032912 W | EM 874872 | Chrysotile | 1 | 0 | 0 | 0 | 0 | 1**L | 1 |
| 3W-032912 N | EM 874873 | ND | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3W-032912 E | EM 874874 | ND | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3W-032912 S | EM 874875 | ND | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

*See Analytical Procedure for definitions

**C = Excluded from total due to lack of confirmation

**L = Excluded from total for length less than 0.5 micron (AHERA only)

**A = Excluded from total due to incorrect aspect ratio

ND = None Detected

Due Date: 3-31-12
Due Time: 845a

RES 232807

REILAB Reservoirs Environmental, Inc.

5801 Logan St. Denver, CO 80216 • Ph: 303 964-1986 • Fax 303-477-4275 • Toll Free :866 RESI-ENV

Pager : 303-509-2098

Page 1 of 1

INVOICE TO: (IF DIFFERENT)

CONTACT INFORMATION:

| | | | |
|---|----------|---------------------------------------|-------------|
| Company: <u>RE Environmental</u> | Company: | Contact: <u>Dave Roskelley</u> | Contact: |
| Address: <u>47 W 90003 #2</u> | Address: | Phone: | Phone: |
| <u>Sandy Ut. 84070</u> | | Fax: | Fax: |
| | | Cell/pager: <u>801 541-1035</u> | Cell/pager: |
| Project Number and/or P.O. #: <u>3rd West Sub RMP</u> | | Final Date Deliverable Email Address: | |
| Project Description/Location: | | <u>dave@renviro.com</u> | |

| ASBESTOS LABORATORY HOURS: Weekdays: 7am - 7pm | | REQUESTED ANALYSIS | | | | | | | | | | VALID MATRIX CODES | | | | LAB NOTES: | | | |
|---|-------------|---------------------------------|---|--------------------------|--------------------------|---|-----------------|----------------|--------------------|--------------|---|---|---------------------------------|--------------------------------|-----------------------------|---|---------------------------------|------------------|-------|
| PLM / PCM / TEM <u>TEM</u> RUSH (Same Day) <u>X</u> PRIORITY (Next Day) STANDARD (Rush PCM = 2hr, TEM = 6hr.) | | PLM - Short report, Point Count | TEM - AHERA, Level II, 7402, ISO, +/-, Quant, Semi-quant, Micro-vac, ISO-Indirect Preps | PCM - 7400A, 7400B, OSHA | DUST - Total, Respirable | METALS - Analysis (RCRA 8, TCLP, Welding Fume, Metals Scan) | ORGANICS - METH | Salmonella +/- | E.coli O157:H7 +/- | Listeria +/- | Aerobic Plate Count +/- or Quantification | E.coli +/- or Quantification | Coliforms +/- or Quantification | S.aureus +/- or Quantification | Y & M +/- or Quantification | Mold +/- Identification, Quantification | Air = A | Bulk = B | |
| CHEMISTRY LABORATORY HOURS: Weekdays: 8am - 5pm | | | | | | | | | | | | | | | | | Dust = D | Paint = P | |
| Metal(s) / Dust RUSH 24 hr. 3-5 Day | | | | | | | | | | | | | | | | | Soil = S | Wipe = W | |
| RCRA 8 / Metals & Welding Fume Scan / TCLP RUSH 5 day 10 day | | | | | | | | | | | | | | | | | Swab = SW | F = Food | |
| Organics 24 hr. 3 day 5 Day | | | | | | | | | | | | | | | | | Drinking Water = DW | Waste Water = WW | |
| MICROBIOLOGY LABORATORY HOURS: Weekdays: 9am - 6pm | | | | | | | | | | | | O = Other | | | | | | | |
| E.coli O157:H7, Coliforms, S.aureus 24 hr. 2 Day 3-5 Day | | | | | | | | | | | | **ASTM E1792 approved wipe media only** | | | | | | | |
| Salmonella, Listeria, E.coli, APC, Y & M 48 Hr. 3-5 Day | | | | | | | | | | | | Sample Volume (L) / Area | Matrix Code | # Containers | Date Collected mm/dd/yyyy | Time Collected hh/mm a/p | EM Number (Laboratory Use Only) | | |
| Mold RUSH 24 Hr 48 Hr 3 Day 5 Day | | | | | | | | | | | | | | | | | | | |
| **Turnaround times establish a laboratory priority, subject to laboratory volume and are not guaranteed. Additional fees apply for afterhours, weekends and holidays.** | | | | | | | | | | | | | | | | | | | |
| Special Instructions: | | | | | | | | | | | | | | | | | | | |
| Client sample ID number (Sample ID's must be unique) | | | | | | | | | | | | | | | | | | | |
| 1 | 3W-032912 W | | | | | | | | | | | | | | | | | | 87482 |
| 2 | 3W-032912 N | | | | | | | | | | | | | | | | | | 73 |
| 3 | 3W-032912 E | | | | | | | | | | | | | | | | | | 74 |
| 4 | 3W-032912 S | | | | | | | | | | | | | | | | | | 75 |
| 5 | | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | |

Number of samples received: 4 (Additional samples shall be listed on attached long form.)

NOTE: REI will analyze incoming samples based upon information received and will not be responsible for errors or omissions in calculations resulting from the inaccuracy of original data. By signing client/company representative agrees that submission of the following samples for requested analysis as indicated on this Chain of Custody shall constitute an analytical services agreement with payment terms of NET 30 days, failure to comply with payment terms may result in a 1.5% monthly interest surcharge.

| | |
|---|---|
| Relinquished By: <u>[Signature]</u> Date/Time: <u>3/29/12</u> | Sample Condition: On Ice Sealed Intact |
| Laboratory Use Only | Temp. (F°) Yes / No Yes / No Yes / No |
| Received By: <u>[Signature]</u> Date/Time: <u>3/30/12 845a</u> Carrier: <u>FedEx</u> | |
| Results: Contact <u>Dave</u> Phone <u>[blank]</u> Email <u>[blank]</u> Fax <u>[blank]</u> Date <u>3/31</u> Time <u>10:35a</u> Initials <u>[blank]</u> | Contact <u>[blank]</u> Phone <u>[blank]</u> Email <u>[blank]</u> Fax <u>[blank]</u> Date <u>[blank]</u> Time <u>[blank]</u> Initials <u>[blank]</u> |
| Contact <u>[blank]</u> Phone <u>[blank]</u> Email <u>[blank]</u> Fax <u>[blank]</u> Date <u>[blank]</u> Time <u>[blank]</u> Initials <u>[blank]</u> | Contact <u>[blank]</u> Phone <u>[blank]</u> Email <u>[blank]</u> Fax <u>[blank]</u> Date <u>[blank]</u> Time <u>[blank]</u> Initials <u>[blank]</u> |

Attachment I

Key to Count Sheets Count Sheets Analytical Procedures

Structures identifications consist of an Asbestos Type followed by a Structure Type

Asbestos Type

A = Amosite
An = Anthophyllite
C = Chrysotile
Cr = Crocidolite
T = Tremolite

Structure Types

F = Fiber
B = Bundle
C = Cluster
M = Matrix

ND = no structures detected
M = other structure associated with a matrix
NAM = Non Asbestos Mineral
XGB = partly obscured by a grid bar

Sizing Conversion

1 length unit = 5 mm on screen = 0.278 micron

1.80 length units = 0.5 micron

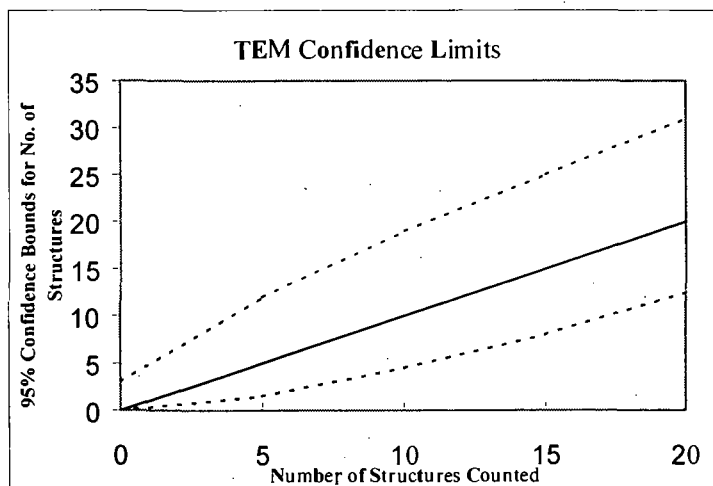
18.0 length units = 5 microns

1 width unit = 1 mm on screen = 0.0556 micron

TEM Analysts

Jeanne S. Orr
Nathan DelHiero
Angela Heitger
Jonathan Bernard

Paul D. LoScalzo
Mark Steiner
Norberto Zimbleman
Robert Workman



Upper and lower 95% confidence bounds for the number of structures counted assuming a Poisson distribution.

Reservoirs Environmental, Inc.
TEM Asbestos Structure Count


| | |
|--|------------------|
| Laboratory name: | REI |
| Instrument | JEOL 100 CX N(S) |
| Voltage (KV) | 100 KV |
| Magnification | 20KX 10KX |
| Grid opening area (mm ²) | 0.01 |
| Scale: 1L = | 0.28 um |
| Scale: 1D = | 0.056 um |
| Primary filter area (mm ²) | 385 |
| Secondary Filter Area (mm ²) | |
| QA Type | |

| | |
|--|---------|
| Orient : | R+R |
| Sample Type (A=Air, D=Dust): | A |
| Air volume (L) or dust area (cm ²) | 828 |
| Date received by lab | 3/30/12 |
| Lab Job Number: | 232807 |
| Lab Sample Number: | 874872 |

| | |
|---|----------------|
| Analyzed by | JK |
| Analysis data | 3/30/12 |
| Method (D=Direct, I=Indirect, IA=Indirect, ashed) | D |
| Counting rules (ISO, AHERA, ASTM) | A-H |
| Grid storage location | Month Analyzed |
| Scope Alignment | Date Analyzed |

F-Factor Calculation (Indirect Preps Only):

| | |
|---|--|
| Fraction of primary filter used | |
| Total Resuspension Volume (ml) | |
| Volume Applied to secondary filter (ml) | |

| Grid | Grid Opening | Structure Type | No. of Structures | | Dimensions | | identification | Mineral Class | | | Sketch/Comments | 1 = yes, blank = no | | |
|------|--------------|----------------|-------------------|-------|------------|-------|-------------------|---------------|----------------|-----|---|---------------------|-------|-----|
| | | | Primary | Total | Length | Width | | Amphibole | C | NAM | | Sketch | Photo | EDS |
| A | G5-4 | ND | | | | | | | | | | | | |
| | F5-4 | ND | | | | | | | | | | | | |
| | E5-4 | F | | 1 | 3 | 1 | CD | | - | |  | | | |
| | | F | | 0 | 1.5 | 1 | CD | | - | | exc. < 5um | | | |
| | C5-4 | ND | | | | | | | | | | | | |
| | E5-3 | ND | | | | | Prep A 90% intact | | 5-7 1/2 debris | | | | | |
| B | H3-1 | ND | | | | | Prep B 80% intact | | 5-7 1/2 debris | | 7/10/12 | | | |
| | G3-1 | ND | | | | | | | | | | | | |
| | F3-1 | ND | | | | | | | | | | | | |
| | E3-1 | ND | | | | | | | | | | | | |

LA = Libby-type amphibole

OA = Other (non-Libby type) amphibole

C = Chrysotile

NAM = Non-asbestos material

Reservoirs Environmental, Inc.
TEM Asbestos Structure Count

Page 1 of _____

| | |
|--|-----------------|
| Laboratory name: | REI |
| Instrument | JEOL 100 CX N 5 |
| Voltage (KV) | 100 KV |
| Magnification | 20KX 10KX |
| Grid opening area (mm ²) | 0.01 |
| Scale: 1L = | 0.28 um |
| Scale: 1D = | 0.056 um |
| Primary filter area (mm ²) | 385 |
| Secondary Filter Area (mm ²) | |
| QA Type | |

| | |
|--|---------|
| Client: | R + R |
| Sample Type (A=Air, D=Dust): | A |
| Air volume (L) or dust area (cm ²) | 896 |
| Date received by lab | 3/30/12 |
| Lab Job Number: | 232807 |
| Lab Sample Number: | 874873 |

F-Factor Calculation (Indirect Preps Only):

| | |
|--|--|
| Fraction of primary filter used | |
| Total Resuspension Volume (ml) | |
| Volumes Applied to secondary filter (ml) | |

| | |
|--|----------------|
| Analyzed by | JH |
| Analysis date | 3/30/12 |
| Method (D=Direct, I=Indirect, IA=Indirect,ashed) | D |
| Counting rules (ISO, AHERA, ASTM) | AH |
| Grid storage location | Month Analyzed |
| Scope Alignment | Data Analyzed |

| Grid | Grid Opening | Structure Type | No. of Structures | | Dimensions | | Identification | Mineral Class | | | Sketch/Comments | 1 = yes, blank = no | | |
|------|--------------|----------------|-------------------|-------|------------|-------|-------------------|---------------|---|-----|-----------------|---------------------|-------|-----|
| | | | Primary | Total | Length | Width | | Amphibole | C | NAM | | Sketch | Photo | EDS |
| A | H5-6 | ND | | | | | | | | | | | | |
| | Q5-6 | ND | | | | | Prep A 90% intact | | | | 5-77 debris | | | |
| | P5-6 | ND | | | | | Prep B 85% intact | | | | 5-77 debris | | | |
| | Q5-6 | ND | | | | | | | | | | | | |
| | C5-6 | ND | | | | | | | | | | | | |
| B | K2-1 | ND | | | | | | | | | | | | |
| | H2-1 | ND | | | | | | | | | | | | |
| | G2-1 | ND | | | | | | | | | | | | |
| | F2-1 | ND | | | | | | | | | | | | |

LA = Libby-type amphibole

OA = Other (non-Libby type) amphibole

C = Chrysotile

NAM = Non-asbestos material

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Reservoirs Environmental, Inc.
TEM Asbestos Structure Count

Page 1 of _____

| | |
|-----------------------------|-----------------|
| Laboratory name: | REI |
| Instrument | JEOL 100 CX N S |
| Voltage (KV) | 100 KV |
| Magnification | (20KX) 10KX |
| Odd opening area (mm2) | 0.01 |
| Scale: 1L = | 0.28 um |
| Scale: 1D = | 0.056 um |
| Primary filter area (mm2) | 385 |
| Secondary Filter Area (mm2) | |
| QA Type | |

| | |
|-----------------------------------|---------|
| Client: | R+R |
| Sample Type (A=Air, D=Dust): | A |
| Air volume (L) or dust area (cm2) | 8.93 |
| Date received by lab | 3/30/12 |
| Lab Job Number: | 232807 |
| Lab Sample Number: | 874874 |

F-Factor Calculation (Indirect Props Only):

| | |
|---|--|
| Fraction of primary filter used | |
| Total Resuspension Volume (ml) | |
| Volume Applied to secondary filter (ml) | |

| | |
|---|----------------|
| Analyzed by | JK |
| Analysis date | 3/20/12 |
| Method (D=Direct, I=Indirect, IA=Indirect, ashed) | D |
| Counting rules (ISO, AHERA, ASTM) | AH |
| Grid storage location | Month Analyzed |
| Scope Alignment | Date Analyzed |

| Grid | Grid Opening | Structure Type | No. of Structures | | Dimensions | | Identification | Mineral Class | | | Sketch/Comments | 1 = yes, blank = no | | |
|------|--------------|----------------|-------------------|-------|------------|-------|------------------------------|---------------|---|-----|-----------------|---------------------|-------|-----|
| | | | Primary | Total | Length | Width | | Amphibole | C | NAM | | Sketch | Photo | EDS |
| A | G6-4 | ND | | | | | | | | | | | | |
| | F6-4 | ND | | | | | | | | | | | | |
| | E6-4 | ND | | | | | Prep A 85% intact 5/1 debris | | | | | | | |
| | C6-4 | ND | | | | | Prep B-A | | | | | | | |
| | B6-4 | ND | | | | | Temp 3/31/12 | | | | | | | |
| B | F4-6 | ND | | | | | | | | | | | | |
| | G4-6 | ND | | | | | | | | | | | | |
| | C4-6 | ND | | | | | | | | | | | | |
| | B4-6 | ND | | | | | | | | | | | | |

LA = Libby-type amphibole

OA = Other (non-Libby type) amphibole

C = Chrysotile

NAM = Non-asbestos material

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Reservoirs Environmental, Inc.
TEM Asbestos Structure Count

| | |
|--|-----------------|
| Laboratory name: | REI |
| Instrument | JEOL 100 CX N S |
| Voltage (KV) | 100 KV |
| Magnification | (20KX) 10KX |
| Grid opening area (mm ²) | 0.01 |
| Scale: 1L = | 0.28 um |
| Scale: 1D = | 0.056 um |
| Primary filter area (mm ²) | 385 |
| Secondary Filter Area (mm ²) | |
| QA Type | |

| | |
|--|---------|
| Client: | R+R |
| Sample Type (A=Air, D=Dust): | A |
| Air volume (L) or dust area (cm ²) | 893 |
| Date received by lab | 3/30/12 |
| Lab Job Number: | 232807 |
| Lab Sample Number: | 874875 |

F-Factor Calculation (Indirect Preps Only):

| | |
|---|--|
| Fraction of primary filter used | |
| Total Resuspension Volume (ml) | |
| Volume Applied to secondary filter (ml) | |

| | |
|---|----------------|
| Analyzed by | TK |
| Analysis date | 3/20/12 |
| Method (O=Direct, I=Indirect, IA=Indirect, ashed) | D |
| Counting rules (ISO, AHERA, ASTM) | AH |
| Grid storage location | Month Analyzed |
| Scope Alignment | Date Analyzed |

| Grid | Grid Opening | Structure Type | No. of Structures | | Dimensions | | Identification | Mineral Class | | | Sketch/Comments | 1 = yes, blank = no | | |
|------|--------------|----------------|-------------------|-------|------------|-------|-----------------------------|---------------|---|-----|-----------------|---------------------|-------|-----|
| | | | Primary | Total | Length | Width | | Amphibole | C | NAM | | Sketch | Photo | EDS |
| A | K6-1 | ND | | | | | | | | | | | | |
| | H6-1 | ND | | | | | Prep A 80% intact 52 debris | | | | | | | |
| | G6-1 | ND | | | | | Prep B 100% intact 2/3/12 | | | | | | | |
| | F6-1 | ND | | | | | | | | | | | | |
| | E6-1 | ND | | | | | | | | | | | | |
| B | K6-1 | ND | | | | | | | | | | | | |
| | H6-1 | ND | | | | | | | | | | | | |
| | G6-1 | ND | | | | | | | | | | | | |
| | F6-1 | ND | | | | | | | | | | | | |

LA = Libby-type amphibole

OA = Other (non-Libby type) amphibole

C = Chrysotile

NAM = Non-asbestos material

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Analytical Procedures – AHERA

Transmission electron microscopy/energy dispersive X-ray spectrometry/selected area electron diffraction (TEM/EDX/SAED) was employed in the analysis of the samples, which were collected on 25 mm mixed cellulose ester air filters. A portion of each filter was collapsed with acetone and etched in a plasma asher. The etched filter was then coated with a thin layer of carbon in a carbon side down. The sample was then placed inside a condensation washer and treated with acetone to remove the filter matrix and expose any inert material.

For each sample, enough grid openings on a 200 mesh TEM grid are analyzed to ensure an analytical sensitivity of at least 0.005 structures/cc. A minimum of four grid openings from two preparations are analyzed for each sample. The grid openings are searched for fibrous structures which, if present are analyzed by SAED and/or EDX (elemental analysis). The AHERA protocol requires SAED confirmation of enough chrysotile asbestos structures on each sample to cause the sample to exceed 70 structures/mm² (usually 4 or 5 structures). Both SAED and EDX confirmation are required of enough amphibole structures on each sample to cause the sample to exceed 70 structures/mm² (usually 4 or 5 structures) per sample. Either SAED or EDX is required for the remaining asbestos structures of either type. The morphology of each structure is determined and the length and the diameter of any asbestos structures are recorded. Asbestos fibers, bundles, cluster and matrices were identified and recorded. The asbestos structures have been defined in AHERA as follows:

| | |
|-----------------|---|
| Fiber: | is a structure having a minimum length greater than or equal to 0.5 micron with an aspect ratio of 5:1 or greater with substantially parallel sides. |
| Bundle: | is a structure composed of three or more fibers in parallel arrangement, with each fiber closer than the diameter of one fiber. |
| Cluster: | is a structure with fibers in random arrangements such that all fibers are intermixed and no single fiber is isolated from the group. |
| Matrix: | is a fiber or fibers with one end free and the other end embedded or hidden by a particulate. The exposed fiber end must meet the fiber definition given above. |

If more than 50 asbestos structures are identified and confirmed on a sample, AHERA analysis may be terminated after completion of the grid opening, which contains the 50th structure. AHERA protocol requires the laboratory to reject any clearance sample which contains in excess of 25% total particulate loading or which appears to be unevenly loaded.

The AHERA protocol includes specific sampling requirements, including minimum numbers of samples and minimum air volumes. Specifically, the 70 structures/mm² clearance criteria is only allowed for sets five inside samples (collected in a group of 13 samples including: five outsides and three blanks) with volumes greater than 1200 liters (40 CFR Part 763, page 41894). Deviation from the AHERA sampling protocol may affect the validity of the analytical results. Analysis of samples collected by non-protocol methods are not accredited by NVLAP

Equations Used for Calculations

$$\text{Area Analyzed, mm}^2 = \# \text{ GO counted} \times \text{Average GO Area (mm)}^2$$

$$\text{Concentration, s/cc} = \frac{\# \text{ Asbestos Structures}}{\# \text{ GO Counted}} \times \frac{1}{\text{Volume (L)}} \times \frac{\text{Eff Filter Area (mm}^2\text{)}}{\text{Average GO area (mm}^2\text{)}} \times \frac{1\text{L}}{1000\text{cc}}$$

$$\text{Filter loading, s/mm}^2 = \frac{\# \text{ Asbestos structures}}{\text{Area Analyzed (mm}^2\text{)}}$$

GO = TEM grid opening